



THE
ONTARIO WATER RESOURCES
COMMISSION

ST. LAWRENCE STARCH COMPANY LIMITED

POLLUTION OF LAKE ONTARIO

COUNTY OF PEEL

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REPORT

Ontario Water Resources Commission

County of Peel -
Town of Port Credit.

Municipality _____ Date of Inspection May 26th, 1964

Re: St. Lawrence Starch Company Limited - Pollution of Lake Ontario.

Field Inspection by R.N. Dawson, P. Eng.,
G. Hopkins. Report by R.N. Dawson

INTRODUCTION:

An investigation of the effect of the waste water discharge from the St. Lawrence Starch Company Limited on the water quality of Lake Ontario was made on May 26th, 1964, by Mr. G. Hopkins, Biology Branch and R.N. Dawson, Stream Sanitation Branch. The survey was carried out to confirm the visual evidence of pollution of the Lakeshore in the immediate vicinity of the outfall.

During the sampling survey, a 20 mph south-west wind was moving the discharge in an easterly direction along the shoreline. The turbid conditions created by the waste flow could be distinguished in a strip extending approximately 1,300 feet east of the outfall and varying in width from 50 to 200 feet.

PROCEDURE

Samples were obtained from the outfall, and from the lake at ranges of 50, 100, 200, 500 and 1,000 feet from the outfall as shown in the accompanying map of the area. Where the water was deeper than five feet, chemical samples were taken at 0.2 depth and 0.8 depth. Bacteriological samples were taken at the surface.

Dissolved oxygen determinations by the Winkler Method (Alsterburg Modification) were performed on the site and temperatures were recorded. The bacteriological and sanitary chemical samples were returned to the OWRC laboratory for examination. Grab samples of the bottom were taken by means of an Eckman dredge and inspected during the investigation. Where biological life was expected, samples were returned to the laboratory for inspection.

RESULTS

The results of the sampling programme are contained in Table I and Table II.

FIELD OBSERVATIONS

White turbid water was noted extending 200 feet south from the shore and easterly approximately 1,300 feet as shown by the shaded area in Figure I. Temperature and dissolved oxygen characteristics of the water also showed the presence of the effluent as it mixed gradually with lake water and moved eastward along the shore.

At all of the points eastward, the temperatures were elevated above the lake temperature of 10-11°C by the discharge of 26°C effluent. In small pockets close to shore, the temperature was raised as high as 17°C.

Similarly the dissolved oxygen content of lake water was depleted at most of the stations within the turbid area. The oxygen content was lowered to 40 per cent or lower at stations in shallow water along the shore and oxygen depletion was noted throughout most of the shaded area.

It was noted that in the turbid area, no added starch was required to accentuate the end-point in the dissolved - oxygen test -- sufficient starch was available in the lake water.

Corn kernels, husks and pulp were observed in the bottom sediments of stations A,C,D,E,B and H, the latter at a distance of 100 feet south of the outfall. At distances of 200 feet from the outfall, no recognizable pollutant was observed, but the growth of sewage fungus and associated micro-organisms (slime) indicated the presence of quantities of putrescible organic matter.

LABORATORY DETERMINATIONS

In Table II, the physical, chemical and bacteriological determinations made on the water in the turbid area are contrasted with the results of the tests from the surrounding clearer water zones. The elevated 5 Day B.O.D. concentrations, suspended solids, free ammonia, total Kjeldahl, turbidity and phosphate levels in the turbid water zone are all indicative of polluted conditions.

The OWRC objective for surface waters is a B.O.D. of less than 4.0 ppm. In the effected area, the B.O.D.'s ranged between 10 and 2,350 ppm, far above the desirable limit. The free ammonia concentrations within this area generally exceed 0.1 ppm which is a concentration indicative of organically enriched water. The phosphate levels are also considerably elevated above those of the surrounding water. Depressed pH's were noted in the turbid area.

In addition to the chemical indications of pollution, the M.F. coliform counts greatly exceeded the 2400 organisms per 100 ml. (OWRC objective) ranging from 6,200 to 330,000 coliforms per 100 ml., within the polluted area.

The B.O.D. in all samples, except those taken 1000 feet south of the outfall and 1300 feet easterly were high. At these sampling locations, the B.O.D. was indicative of normal lake conditions. The only sample with a satisfactory coliform density was obtained 1000 feet south of the outfall. All of the phosphate and free ammonia levels were typical of organically enriched water.

CONCLUSIONS

The outfall from the St. Lawrence Starch Company plant was polluting the water easterly offshore from Port Credit. In a localized area within at least 100 feet of the outfall, accumulations of waste products occur as sediment, but further offshore the water quality is influenced more by suspended putrescible organic matter.

Excessive B.O.D. concentrations, turbidities, coliform densities, phosphates, and free ammonia levels resulted from the discharge. Depressed dissolved oxygen contents were determined in the visibly effected area exhibiting as low as 40 per cent saturation. The discharge also appreciably depresses the pH for a considerable distance.

Judging by the nature of the bottom slime to distances of 1000 feet from the outfall, it was evident that the effluent from the St. Lawrence Starch Company plant has generally widespread overall effects as influenced by the prevailing wind on any particular day.

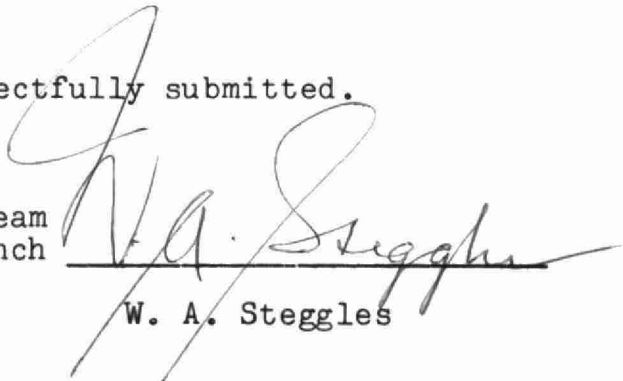
The discharge is definitely contributing to the organic enrichment of Lake Ontario, and adversely effects the physical, chemical, bacterial and biological water quality along the shoreline.

RECOMMENDATION

Treatment of the waste water should be provided.

All of which is respectfully submitted.

Supervisor of Stream
Surveys Branch


W. A. Steggles

Approved by _____

K. H. Sharpe, Director

TABLE 1

| STA. | SAMPLING POINT | DESCRIPTION | FIELD OBSERVATIONS | | | DISSOLVED OXYGEN | | | BOTTOM CONDITIONS |
|------|-------------------|---------------------------------------|--------------------|-----------------|--------------|------------------|----|------|--|
| | | | TOTAL DEPTH | SAMPLE DEPTH | TEMP. °C. | TPM | % | SAT. | |
| A. | 1. | OUTFALL SEWER. | 2 | 1 | 26 | 0 | 0 | | BLACK SEDIMENT, CORN KERNELS, HUSKS |
| C. | 2. | 50' RANGE-WEST. | 4.5 | 2 | 24 | 0.5 | 8 | | BLUE GREY SEDIMENT, CORN KERNELS, HUSKS |
| D. | 3. | 50' RANGE-SOUTH. | 4.5 | 2 | 14 | 9.8 | 95 | | CORN KERNELS, HUSKS, PULP, FUNGUS GROWTH |
| E. | 4. | 50' RANGE-EAST. | 4.5 | 2 | 13 | 4.5 | 43 | | CORN KERNELS, HUSKS, PULP |
| B. | 5. | 50' RANGE-SOUTH OF HURONTARIO ST. | 10 | 1 | 11 | 10.6 | 95 | | |
| B. | 6. | " | | 9 | 11 | 10.5 | 95 | | SLIME ON FINE SAND, KERNELS & PULP |
| G. | 7. | 100' RANGE SOUTH OF HURONTARIO ST. | 10 | 1 | 11 | 10.8 | | | |
| G. | 8. | " | | 9 | 11 | 9.9 | 91 | | SLIME ON BEDROCK |
| H. | 9. | 100' RANGE SOUTH OF OUTFALL. | 12 | 1 | 12 | 10.4 | | | |
| H. | 10. | " | | 11 | 12 | 9.4 | | | SLIME ON FINE SAND, CORN, DOMESTIC SEWAGE |
| I. | 11. | 100' RANGE AT SECOND PT. E. | 4 | 2. | 15 | 5.6 | | | SLIME ON BEDROCK |
| F. | 12. | 75' RANGE AT SHORE PT. E. | 2 | 1 | 17 | 3.9 | 40 | | SLIME ON BEDROCK |

TABLE 1

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FIELD OBSERVATIONS

| STA. | SAMPLING POINT | DESCRIPTION | TOTAL DEPTH | SAMPLE DEPTH | TEMP. °C. | DISSOLVED OXYGEN | | | BOTTOM CONDITIONS |
|------|-------------------|---|----------------|-----------------|--------------|------------------|--------|--|-------------------|
| | | | | | | PPM | % SAT. | | |
| L. | 13. | 200' RANGE 3RD. PT. EAST. | 2.5 | 1 | 14 | 4.8 | 46 | | SLIME ON BEDROCK |
| K. | 14. | 200' RANGE OFF OUTLET. | 13 | 1 | 12 | 10.1 | | | SLIME ON BEDROCK |
| K. | 15. | " | " | 12 | 12 | 9.9 | | | SLIME ON BEDROCK |
| J. | 16. | 200' RANGE SOUTH OF HURONTARIO STREET. | | 1 | 11 | 10.8 | | | SLIME ON BEDROCK |
| J. | 17. | " | 11 | 10 | 11 | 10.8 | | | SLIME ON BEDROCK |
| M. | 18. | 500' RANGE SOUTH OF HURONTARIO STREET. | 15 | 1 | 10 | 10.8 | | | SLIME ON BEDROCK |
| M. | 19. | " | 15 | 14 | 10 | 11.4 | | | SLIME ON BEDROCK |
| N. | 20. | 500' RANGE SOUTH OF OUTFALL. | 17 | 1 | 11.5 | 11.4 | | | SLIME ON BEDROCK |
| N. | 21. | " | — | 16 | 11.0 | 10.2 | | | SLIME ON BEDROCK |
| O. | 22. | 500' RANGE 4TH PT. EAST. | 2 | 1 | 11.0 | 10.1 | | | SLIME ON BEDROCK |
| Q. | 23. | 1000' RANGE AT MARKER BUOY. | 30 | 1 | 10.0 | 11.9 | | | SLIME ON BEDROCK |
| Q. | 24. | " | 30 | 29 | 10.0 | 12.5 | | | SLIME ON BEDROCK |
| P. | 25. | 50' FROM SHORE AT OAKWOOD AVENUE. | 2.5 | 2 | 12.5 | 7.9 | 73 | | SLIME ON BEDROCK |

TABLE 11

LABORATORY ANALYSES

WITHIN TURBID AREA.

| STA. | DEPTH FT. | B.O.D. PPM | S.S. PPM | FREE AMMONIA PPM | TOTAL KJELDAHL PPM | PHOSPHOROUS PPM | PH | TURBIDITY UNITS | M.F. COLIFORM COUNT | TEMP. °C | DISSOLVE O ₂ PPM |
|------|--------------|---------------|-------------|------------------------|--------------------------|--------------------|-----|--------------------|---------------------------|-------------|-----------------------------------|
| A | 1 | 2350 | 1170 | 5.7 | 58.0 | 40.0 | 5.8 | 360 | 330,000 | 26 | 0 |
| C | 2 | 760 | 246 | 4.9 | 41.0 | 21.0 | 5.3 | 160 | 240,000 | 24 | 0.5 |
| D | 2 | 24 | 30 | 0.13 | 3.3 | 2.6 | 6.8 | 21 | 107,000 | 14 | 9.8 |
| E | 2 | 180 | 74 | 1.0 | 13.0 | 10.0 | 5.3 | 60 | 140,000 | 13 | 4.5 |
| H | 1 | 24 | 4 | 0.1 | 1.6 | 0.1 | 7.5 | 9.0 | 6,200 | 12 | 10.4 |
| H | 11 | 10 | 24 | 0.13 | 3.3 | 2.0 | 7.0 | 21 | ----- | 12 | 9.4 |
| I | 2 | 130 | 54 | 0.8 | 8.3 | 7.0 | 5.8 | 45 | 115,000 | 15 | 5.6 |
| F | 1 | 125 | 72 | 0.8 | 10.0 | 7.5 | 5.9 | 45 | 91,000 | 17 | 3.9 |
| L | 1 | 60 | 38 | 0.21 | 10.0 | 4.0 | 6.2 | 33 | 162,000 | 14 | 4.8 |
| K | 1 | 13 | 13 | 0.1 | 1.4 | 0.8 | 7.4 | 7.5 | 10,100 | 12 | 10.1 |
| K | 12 | 14 | 15 | 0.06 | 1.5 | 0.8 | 7.6 | 9.5 | | 12 | 9.9 |
| P | 2 | 12 | 26 | 0.16 | 1.7 | 2.0 | 7.0 | 27 | 8,500 | 12.5 | 7.9 |

TABLE 11

LABORATORY ANALYSES

WITHOUT TURBID AREA

| STA. | DEPTH FT. | B.O.D. PPM | S.S. PPM | FREE AMMONIA PPM | TOTAL KJELDAHL PPM | PHOSPHOROUS PPM | PH | TURBIDITY UNITS | M.F. COLIFORM COUNT | TEMP. °C | DISSOLVE O ₂ PPM |
|------|--------------|---------------|-------------|------------------------|--------------------------|--------------------|-----|--------------------|---------------------------|-------------|-----------------------------------|
| B | 9 | 6.2 | 8 | 0.1 | 1.0 | 0.45 | 7.7 | 3.8 | 8,600 | 11 | 10.6 |
| B | 1 | --- | 11 | 0.1 | 1.0 | 0.55 | 7.6 | 6.0 | ----- | 11 | 10.5 |
| G | 9 | 5.6 | 10 | 0.1 | 0.71 | 0.35 | 7.8 | 4.5 | 10,200 | 11 | 10.8 |
| G | 1 | --- | 15 | 0.1 | 1.6 | 0.95 | 7.4 | 8.5 | ----- | 11 | 9.8 |
| J | 1 | 7.6 | 12 | 0.08 | 1.0 | 0.45 | 7.6 | 4.5 | 6,700 | 11 | 10.8 |
| J | 10 | 8.0 | 12 | 0.06 | 1.0 | 0.6 | 7.8 | 4.5 | ----- | 11 | 10.8 |
| M | 1 | 6.3 | 8 | 0.1 | 1.0 | 0.6 | 7.7 | 4.5 | 4,200 | 10 | 11.4 |
| M | 14 | 7.4 | 10 | 0.06 | 1.0 | 0.5 | 7.8 | 5.0 | ----- | 10 | 11.5 |
| N | 1 | 7.6 | 10 | 0.08 | 1.1 | 0.45 | 7.8 | 5.0 | 5,100 | 11.5 | 11.4 |
| N | 16 | 4.0 | 5 | 0.1 | 1.1 | 1.0 | 7.3 | 11.0 | ----- | 11 | 10.2 |
| O | 1 | 2.7 | 8 | 0.08 | 2.2 | 0.25 | 7.9 | 1.8 | 6,700 | 11 | 10.1 |
| Q | 1 | 1.4 | 63 | 0.1 | 1.6 | 0.15 | 8.1 | 2.8 | 70 | 10 | 11.9 |
| Q | 29 | 1.9 | 6 | 0.1 | 0.91 | 0.1 | 8.1 | --- | --- | 10 | 12.5 |

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